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10/575,554	04/10/2006	Yoshiaki Hirose	YMUCP011	8941

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EXAMINER	
GREGORIO, GUINEVER S	

ART UNIT	PAPER NUMBER
1793	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/575,554	HIROSE, YOSHIAKI	
	Examiner	Art Unit	
	GUINEVER S. GREGORIO	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _14 November 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-16_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-16_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _11/05/2008_.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Applicant's arguments with respect to claims 1-16 have been considered but are moot in view of the new ground(s) of rejection necessitated by amendment.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. **Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Norimichi (Japanese Pat. No. JP-2566244).** Norimichi teaches a graphite sheet with thermal conductivity more than 120Kcal/m-hr (140 W/ (m°K)), in the direction of the sheet which corresponds to a thermal conductivity parallel to the surface (Detailed Description, paragraph 12, lines 6-7). Thermal conductivity of more than 140 W/(m°K) encompasses the claimed range of 350 W/(m°K) or more. Additionally, Norimichi teaches in Example 1 a flexible graphite sheet material made only of a thermal expansion vapor growth graphite fiber material and having a surface wise thermal conductivity of 600Kcal/(m.hr. °C), or 697W/(m. K). Examiner takes the position that the expanded graphite sheet will have a thermal conductivity close to the graphite fiber's thermal conductivity. Furthermore, Norimichi teaches to immerse a graphite in a mixed liquor of a mixed solution of fuming nitric acid or concentrated sulfuric acid and nitric acid, potassium chlorate, chromic acid, potassium permanganate, perchloric acid, hydrogen peroxide

etc, which corresponds to graphite which has been soaked in a liquid (paragraph 1, lines 4-6). Norimichi then further teaches heating the graphite to temperatures of 100 °C or more which corresponds to heat-treating (paragraph 1, line 8).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

2. **Claims 2 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Norimichi in view of Kazuhiko et al. (Japanese Pub. No. 2003-297770).**

3. Norimichi teaches a graphite sheet with thermal conductivity more than 120Kcal/m-hr (140 W/ (m°K)), in the direction of the sheet which corresponds to a thermal conductivity parallel to the surface (Detailed Description, paragraph 12, lines 6-7). Thermal conductivity of more than 140 W/(m°K) encompasses the claimed range of 350 W/(m°K) or more. Additionally, Norimichi teaches in Example 1 a flexible graphite sheet material made only of a thermal expansion vapor growth graphite fiber material

and having a surface wise thermal conductivity of 600Kcal/(m.hr. °C), or 697W/(m. K). Examiner takes the position that the expanded graphite sheet will have a thermal conductivity close to the graphite fiber's thermal conductivity. Furthermore, Norimichi teaches to immerse a graphite in a mixed liquor of a mixed solution of fuming nitric acid or concentrated sulfuric acid and nitric acid, potassium chlorate, chromic acid, potassium permanganate, perchloric acid, hydrogen peroxide etc, which corresponds to graphite which has been soaked in a liquid (paragraph 1, lines 4-6). Norimichi then further teaches heating the graphite to temperatures of 100 °C or more which corresponds to heat-treating (paragraph 1, line 8). Norimichi teaches a graphite sheet with thermal conductivity preferably below 700 micro-ohm/cm in the direction of the sheet which corresponds to a thermal conductivity parallel to the surface (Detailed Description, paragraph 12, lines 6-7). Norimichi does not teach an arithmetic mean surface roughness or bulk density.

4. Kazuhiko et al. teaches a surface roughness, Ra, 0.1-10 µm (paragraph 27, line 1). Kazuhiko et al. teaches if the surface roughness is less than 0.1 µm the reaction occurs easily due to complete contact which is undesirable (paragraph 28, line 1). Alternatively, Kazuhiko teaches if the surface roughness is over 10.0 µm reaction occurs easily at protruded parts, which is also undesirable (paragraph 28, lines 1-2). Furthermore, Kazuhiko et al. teaches a surface roughness is the arithmetic mean deviation defined by JIS B0601-1994. (paragraph 28, lines 2-3).

5. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a mathematical function known in the art such as the arithmetic mean

deviation to determine the proper surface roughness so that the product does not have undesirable protrusions.

6. **Regarding claim 14,** Kazuhiko et al. teaches the density of the expanded graphite sheet is 0.8-2.2 g/cm^3 which is 0.8-2.2 Mg/m^3 (paragraph 15, line 1). Kazuhiko et al. teaches if the density falls within this range, irregularities or unevenness or roughness at the level of crystals is formed on the surfaces and helps to anchor what is laid on the surface (paragraph 15, lines 1-6) It would have been obvious to one of ordinary skill in the art at the time of the invention to keep the density of the graphite sheet between 0.8-2.2 Mg/m^3 in order to provide enough friction to anchor what is laid on the surface of the graphite sheet.

7. **Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Norimichi as applied to claim 1 above, and further in view of Kazuhiko et al. (Japanese Pub. No. 2003-297770).** Norimichi teaches a graphite sheet with thermal conductivity more than 120Kcal/m-hr (140 W/ (m°K)), in the direction of the sheet which corresponds to a thermal conductivity parallel to the surface (Detailed Description, paragraph 12, lines 6-7). Thermal conductivity of more than 140 W/(m°K) encompasses the claimed range of 350 W/(m°K) or more. Additionally, Norimichi teaches in Example 1 a flexible graphite sheet material made only of a thermal expansion vapor growth graphite fiber material and having a surface wise thermal conductivity of 600Kcal/(m.hr. °C), or 697W/(m. K). Examiner takes the position that the expanded graphite sheet will have a thermal conductivity close to the graphite fiber's thermal conductivity. Furthermore, Norimichi teaches to immerse a graphite in a mixed liquor of a mixed

solution of fuming nitric acid or concentrated sulfuric acid and nitric acid, potassium chlorate, chromic acid, potassium permanganate, perchloric acid, hydrogen peroxide etc, which corresponds to graphite which has been soaked in a liquid (paragraph 1, lines 4-6). Norimichi then further teaches heating the graphite to temperatures of 100 °C or more which corresponds to heat-treating (paragraph 1, line 8). Norimichi teaches a graphite sheet with thermal conductivity preferably below 700 micro-ohm/cm in the direction of the sheet which corresponds to a thermal conductivity parallel to the surface (Detailed Description, paragraph 12, lines 6-7). Norimichi does not teach an arithmetic mean surface roughness or bulk density.

8. Kazuhiko et al. teaches a surface roughness, Ra, 0.1-10 μm (paragraph 27, line 1). Kazuhiko et al. teaches if the surface roughness is less than 0.1 μm the reaction occurs easily due to complete contact which is undesirable (paragraph 28, line 1). Alternatively, Kazuhiko teaches if the surface roughness is over 10.0 μm reaction occurs easily at protruded parts, which is also undesirable (paragraph 28, lines 1-2). Furthermore, Kazuhiko et al. teaches a surface roughness is the arithmetic mean deviation defined by JIS B0601-1994. (paragraph 28, lines 2-3).

9. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a mathematical function known in the art such as the arithmetic mean deviation to determine the proper surface roughness so that the product does not have undesirable protrusions.

10. **Regarding claim 13,** Kazuhiko et al. teaches the density of the expanded graphite sheet is 0.8-2.2 g/cm^3 which is 0.8-2.2 Mg/m^3 (paragraph 15, line 1). Kazuhiko

et al. teaches if the density falls within this range, irregularities or unevenness or roughness at the level of crystals is formed on the surfaces and helps to anchor what is laid on the surface (paragraph 15, lines 1-6) It would have been obvious to one of ordinary skill in the art at the time of the invention to keep the density of the graphite sheet between 0.8-2.2 Mg/m^3 in order to provide enough friction to anchor what is laid on the surface of the graphite sheet.

11. **Claims 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Norimichi in view of Taomoto et al. (Japanese Pat. No. JP20000016808).** Norimichi teaches a graphite sheet with thermal conductivity more than 120Kcal/m-hr (140 W/(m°K)), in the direction of the sheet which corresponds to a thermal conductivity parallel to the surface (Detailed Description, paragraph 12, lines 6-7). Thermal conductivity of more than 140 W/(m°K) encompasses the claimed range of 350 W/(m°K) or more. Additionally, Norimichi teaches in Example 1 a flexible graphite sheet material made only of a thermal expansion vapor growth graphite fiber material and having a surface wise thermal conductivity of 600Kcal/(m.hr. °C), or 697W/(m. K). Examiner takes the position that the expanded graphite sheet will have a thermal conductivity close to the graphite fiber's thermal conductivity. Furthermore, Norimichi teaches to immerse a graphite in a mixed liquor of a mixed solution of fuming nitric acid or concentrated sulfuric acid and nitric acid, potassium chlorate, chromic acid, potassium permanganate, perchloric acid, hydrogen peroxide etc, which corresponds to graphite which has been soaked in a liquid (paragraph 1, lines 4-6). Norimichi then further teaches heating the graphite to temperatures of 100 ºC or more which corresponds to heat-treating

(paragraph 1, line 8). Norimichi teaches a graphite sheet with thermal conductivity preferably below 700 micro-ohm/cm in the direction of the sheet which corresponds to a thermal conductivity parallel to the surface (Detailed Description, paragraph 12, lines 6-7). Norimichi does not teach lowest and highest values of local thermal conductivities at various spots in the expanded graphite sheet. Taomoto et al. teaches eliminating the unevenness of the graphite sheet improves the uniformity of thickness, flexibility, toughness, and heat conductivity (abstract, lines 10-15).

12. Taomoto et al. teaches eliminating the unevenness of the graphite sheet improves the uniformity of thickness, flexibility, toughness, and heat conductivity (abstract, lines 10-15).

13. It would have been obvious to one of ordinary skill in the art at the time of the invention to make the thickness of the graphite sheet consistent so that the conductivity remains consistent along the surface. Furthermore the tolerance for error will depend on the application of the graphite sheet and can be ascertained by one of ordinary skill in the art.

14. **Claims 4 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Norimichi and Kazuhiko as applied to claim 2 above, and further in view of Taomoto et al.** Norimichi teaches a graphite sheet with thermal conductivity preferably below 700 micro-ohm/cm in the direction of the sheet which corresponds to a thermal conductivity parallel to the surface (Detailed Description, paragraph 12, lines 6-7). Kazuhiko et al. teaches a surface roughness, Ra, 0.1-10 μm (paragraph 27, line 1).

Neither Norimichi nor Kazuhiko et al. teaches lowest and highest values of local thermal conductivities at various spots in the expanded graphite sheet.

15. Taomoto et al. teaches eliminating the unevenness of the graphite sheet improves the uniformity of thickness, flexibility, toughness, and heat conductivity (abstract, lines 10-15).

16. It would have been obvious to one of ordinary skill in the art at the time of the invention to make the thickness of the graphite sheet consistent so that the conductivity remains consistent along the surface. Furthermore the tolerance for error will depend on the application of the graphite sheet and can be ascertained by one of ordinary skill in the art.

17. **Regarding claim 16,** Kazuhiko et al. teaches the density of the expanded graphite sheet is 0.8-2.2 g/cm^3 which is 0.8-2.2 Mg/m^3 (paragraph 15, line 1). Kazuhiko et al. teaches if the density falls within this range, irregularities or unevenness or roughness at the level of crystals is formed on the surfaces and helps to anchor what is laid on the surface (paragraph 15, lines 1-6) It would have been obvious to one of ordinary skill in the art at the time of the invention to keep the density of the graphite sheet between 0.8-2.2 Mg/m^3 in order to provide enough friction to anchor what is laid on the surface of the graphite sheet.

18. **Claims 5, 6, 7, 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 1-4 above.** By providing a thermal conductivity of 350 W/(m K) or more, as encompassed by more than 140 W/(m K) as

disclosed by Norimichi, a sheet having an electromagnetic-wave-shielding effect of 60dBμV/m or more in the frequency range of 100-800 MHz is obviously provided.

19. **Claims 9, 10, 11, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 1-4 above, and further in view of Hirose et al. (U.S. Pub. No. 2004/0043220 A1).**

20. Norimichi teaches a graphite sheet with thermal conductivity preferably below 700 micro-ohm/cm in the direction of the sheet which corresponds to a thermal conductivity parallel to the surface (Detailed Description, paragraph 12, lines 6-7). Kazuhiko et al. teaches a surface roughness, Ra, 0.1-10 μm (paragraph 27, line 1). Taomoto et al. teaches eliminating the unevenness of the graphite sheet improves the uniformity of thickness, flexibility, toughness, and heat conductivity (abstract, lines 10-15). Norimichi, Kazuhiko et al., or Taomoto et al. do not teach a total impurity content of 10 ppm or less.

21. Hirose et al. teaches a high purity expanded graphite sheet with impurity not exceeding 10 ppm has a high degree of flexibility (paragraph 12, lines 9-13). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a high purity graphite sheet because the graphite sheet would be flexible and therefore more durable.

22. **Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Norimichi and Taomoto as applied to claim 3 above, and further in view of Kazuhiko et al.** Norimichi teaches a graphite sheet with thermal conductivity preferably below 700 micro-ohm/cm in the direction of the sheet which corresponds to a thermal

conductivity parallel to the surface (Detailed Description, paragraph 12, lines 6-7). Norimichi does not teach a bulk density. Taomoto et al. teaches eliminating the unevenness of the graphite sheet improves the uniformity of thickness, flexibility, toughness, and heat conductivity (abstract, lines 10-15).

23. Kazuhiko et al. teaches the density of the expanded graphite sheet is 0.8-2.2 g/cm^3 which is 0.8-2.2 Mg/m^3 (paragraph 15, line 1). Kazuhiko et al. teaches if the density falls within this range, irregularities or unevenness or roughness at the level of crystals is formed on the surfaces and helps to anchor what is laid on the surface (paragraph 15, lines 1-6). It would have been obvious to one of ordinary skill in the art at the time of the invention to keep the density of the graphite sheet between 0.8-2.2 Mg/m^3 in order to provide enough friction to anchor what is laid on the surface of the graphite sheet.

Response to Arguments

24. First and foremost applicant argues "The present invention relates to a sheet made from expanded graphite which has been obtained by heat-treating and has become wool-like" on page 5 of Remarks. Unfortunately, the limitation of "cotton wool-like" is not claimed and therefore need not be addressed. Furthermore, since the graphite sheet taught by Norimichi teaches a graphite sheet with thermal conductivity more than 120Kcal/m-hr (140 W/ (m°K)) which encompasses a thermal conductivity o 350 W/(m°K) or more, and the thermal conductivity is in the direction of the sheet which corresponds to a thermal conductivity parallel to the surface (Detailed Description, paragraph 12, lines 6-7). Additionally, Norimichi teaches in Example 1 a flexible

graphite sheet material made only of a thermal expansion vapor growth graphite fiber material and having a surface wise thermal conductivity of 600Kcal/(m.hr. °C), or 697W/(m. K) which is encompassed by a thermal conductivity of 350 W/(m°K) or more. Examiner takes the position that the expanded graphite sheet will have a thermal conductivity close to the graphite fiber's thermal conductivity. Furthermore, Norimichi teaches to immerse a graphite in a mixed liquor of a mixed solution of fuming nitric acid or concentrated sulfuric acid and nitric acid, potassium chlorate, chromic acid, potassium permanganate, perchloric acid, hydrogen peroxide etc, which corresponds to graphite which has been soaked in a liquid (paragraph 1, lines 4-6). Norimichi then further teaches heating the graphite to temperatures of 100 ºC or more which corresponds to heat-treating (paragraph 1, line 8). Therefore since Norimichi teaches the limitations claimed by applicant Examiner believes the rejection based on Norimichi is proper.

25. Lastly, Examiner is confused by applicants arguments that Norimichi is distinguishable from applicants graphite sheet because Norimichi is a product from a "thermal expansion vapor growth graphite fiber" while applicants invention is from "expanded graphite which is made by soaking natural or kish graphite in a liquid such as sulfuric or metric acid and then heat treating the graphite over 400 ºC," specification page 6, lines 16-18. Norimichi graphite fibers treated with a mixed solution and then heat treated (paragraph 1, lines 4-8). Since both applicant and Norimichi teach graphite fibers treated by an acid solution, heat treated, and then further processed to form a graphite sheet Examiner is not persuaded by applicant's argument that the expanded

graphite sheet taught by Norimichi is distinguishable from applicant's claimed invention. Furthermore, Norimichi teaches the thermal expansion graphite fibers shows the same property as the thermal expansion graphite obtained from natural graphite (paragraph 9, lines 7-8).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GUINEVER S. GREGORIO whose telephone number is (571)270-5827. The examiner can normally be reached on Monday-Thursday, 10:30-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curt Mayes can be reached on 571-272-1234. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Gsg
January 2, 2009

/Melvin Curtis Mayes/
Supervisory Patent Examiner, Art Unit 1793